



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/928,860	08/13/2001	Peter C. Van Buskirk	ATMI-0357-DIV	8391

7590 12/01/2003  
Robert A. McLauchlan, III  
ATMI, Inc.  
7 Commerce Drive  
Danbury, CT 06810

EXAMINER

FULLER, ERIC B

ART UNIT PAPER NUMBER

1762

DATE MAILED: 12/01/2003

4

Please find below and/or attached an Office communication concerning this application or proceeding.

cb4

# Office Action Summary

Application No.

09/928,860

Applicant(s)

VAN BUSKIRK ET AL.

Examiner

Eric B Fuller

Art Unit

1762

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 13 August 2001.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 38-60 and 62-64 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 28-60 and 62-64 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

## Priority under 35 U.S.C. §§ 119 and 120

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☐ All b) ☐ Some \* c) ☐ None of:  
1. ☐ Certified copies of the priority documents have been received.  
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).  
\* See the attached detailed Office action for a list of the certified copies not received.
- 13) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.  
a) ☐ The translation of the foreign language provisional application has been received.
- 14) ☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

## Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 2.
- 4) ☐ Interview Summary (PTO-413) Paper No(s) \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

Art Unit: 1762

## **DETAILED ACTION**

### ***Claim Observations***

The units in claim 62 are unclear. For examination purposes, it is assumed to be micrometers, as is consistent with the specification. Similar problems exist in claims 59 and 64 for the "proportional" sign.

### ***Claim Rejections - 35 USC § 112***

Claims 59 and 64 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. It is unclear if these claims must comprise all of the limitations in the tables or just at least one, i.e. it is unclear if the columns are designated as having an "and" operator or an "or" operator.

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 38-42, 50, 51, 53-55, 57-60, and 62-63 are rejected under 35 U.S.C. 103(a) as being unpatentable over Satoh et al. (US 5,757,061) in view of Roeder et al. (TI, Defense Systems & Electronics Group).

Satoh teaches a ferroelectric PZT material having a dimensionally scalable character (column 8, lines 33-46; column 9, lines 35-40; column 11, lines 9-21), a  $P_{sw}$  greater than  $20 \mu\text{C}/\text{cm}^2$  (column 1, lines 67), a leakage current density less than  $10^{-5} \text{ A}/\text{cm}^2$  (fig. 5; column 10, lines 6-10; column 11, lines 9-21), and an  $E_c$  property (column 3, line 22; column 9, line 57; column 11, lines 9-21). Satoh also teaches a FeRAM device including a stack capacitor (Fig. 1) comprising the ferroelectric PZT material having a capacitor area of  $100 \mu\text{m}^2$  (column 9, lines 35-40) and thickness of 100 nm (column 8, line 37) on a Pt electrode. The PZT material is deposited by means of a MOCVD method (abstract). The reference is silent to using liquid delivery MOCVD.

However, Roeder teaches a method of liquid delivery MOCVD that is capable of depositing PZT layers that have the same  $P_{sw}$  as Satoh (abstract). Therefore, it would have been obvious at the time the invention was made to a person having ordinary skill in the art to use the liquid delivery MOCVD method, and the corresponding precursors (experiment), in the process taught by Satoh. By doing so, one would have a reasonable expectation of success, as Satoh teaches to use a MOCVD method and Roeder teaches a MOCVD method that is capable of achieving the same constraints on the deposited material. Additionally, Roeder teaches plateau effect distribution (page 3, last paragraph, to page 6) in order to optimize that properties and deposition of the PZT

Art Unit: 1762

material. It would have been obvious at the time the invention was made to a person having ordinary skill in the art to use plateau effect distribution in the process taught by Satoh. By doing so, the properties and deposition of the PZT material are optimized.

Claims 43-49 rejected under 35 U.S.C. 103(a) as being unpatentable over Satoh et al. (US 5,757,061) in view of Roeder et al. (TI, Defense Systems & Electronics Group), as applied to claim 38 above, and further in view of Baum et al. (US 5,916,359).

Satoh, in view of Roeder, teaches the limitations of claim 38, but fails to explicitly teach all the claimed precursors and is silent to the identity of the solvent. However, Baum teaches suitable precursors and solvents for liquid delivery MOCVD of ferroelectric layers in column 3, lines 40-50 and the examples. To use these precursors and/or solvents in the process taught by Satoh in view of Roeder would have been obvious at the time the invention was made to a person having ordinary skill in the art. By doing so, one would have a reasonable expectation of success, as both reference are concerned with depositing ferroelectric layers by liquid delivery MOCVD.

Claim 52 is rejected under 35 U.S.C. 103(a) as being unpatentable over Satoh et al. (US 5,757,061) in view of Roeder et al. (TI, Defense Systems & Electronics Group), as applied to claim 38 above, and further in view of Visokay et al. (US 6,211,034 B1).

Satoh, in view of Roeder, teaches the limitations of claim 38, but fails to explicitly teach the barrier layer. However, Visokay teaches a barrier layer made of TiAlN for limiting diffusion of the ferroelectric material in the substrate (column 2, lines 5-15). The

Art Unit: 1762

reference also teaches that iridium is useful as an adhesion layer (column 7, lines 5-18). To use the barrier layer and adhesion layer taught by Visokay in the process of Satoh in view of Roeder would have been obvious at the time the invention was made to a person having ordinary skill in the art. By doing so, one would prevent diffusion and increase adhesion of the PZT layer.

Claim 56 is rejected under 35 U.S.C. 103(a) as being unpatentable over Satoh et al. (US 5,757,061) in view of Roeder et al. (TI, Defense Systems & Electronics Group), as applied to claim 38 above, and further in view of Kim et al. (US 6,229,166 B1).

Satoh, in view of Roeder, teaches the limitations of claim 38, but fails to explicitly teach the nucleation layer. However, Kim teaches that a nucleation layer reduces that non-desirable imprint phenomenon (column 1, lines 60-68; column 2, lines 19-49). To use the nucleation layer taught by Kim in the process of Satoh in view of Roeder would have been obvious at the time the invention was made to a person having ordinary skill in the art. By doing so, one would prevent the imprint phenomenon.

Claims 38-42, 50, 51, 53-55, 57-60, and 62-63 are rejected under 35 U.S.C. 103(a) as being unpatentable over Miki et al. (US 6,309,894 B1) in view of Roeder et al. (TI, Defense Systems & Electronics Group).

Miki teaches a ferroelectric PZT material having an E-field scalable character (column 4, line 47; column 8, line 59; column 9, lines 34-40), a  $P_{sw}$  greater than 20  $\mu C/cm^2$  (column 9, line 63 – column 10, line 2), and a leakage current density less than

Art Unit: 1762

$10^{-5}$  A/cm<sup>2</sup> (column 8, lines 63-67). Miki also teaches a FeRAM device including a stack capacitor comprising the ferroelectric PZT material having a thickness of 100 nm (column 8, line 59) on a Pt electrode. The reference is silent to using liquid delivery MOCVD as the deposition means.

However, Roeder teaches a method of liquid delivery MOCVD that is capable of depositing PZT layers that have the same  $P_{sw}$  as Miki (abstract). Therefore, it would have been obvious at the time the invention was made to a person having ordinary skill in the art to use the liquid delivery MOCVD method, and the corresponding precursors (experiment), in the process taught by Miki. By doing so, one would have a reasonable expectation of success, as Roeder teaches a deposition method that is capable of achieving the same constraints on the deposited material. Additionally, Roeder teaches plateau effect distribution (page 3, last paragraph, to page 6) in order to optimize that properties and deposition of the PZT material. It would have been obvious at the time the invention was made to a person having ordinary skill in the art to use plateau effect distribution in the deposition method. By doing so, the properties and deposition of the PZT material are optimized.

Claims 43-49 rejected under 35 U.S.C. 103(a) as being unpatentable over Miki et al. (US 6,309,894 B1) in view of Roeder et al. (TI, Defense Systems & Electronics Group), as applied to claim 38 above, and further in view of Baum et al. (US 5,916,359).

Miki, in view of Roeder, teaches the limitations of claim 38, but fails to explicitly teach all the claimed precursors and is silent to the identity of the solvent. However,

Art Unit: 1762

Baum teaches suitable precursors and solvents for liquid delivery MOCVD of ferroelectric layers in column 3, lines 40-50 and the examples. To use these precursors and/or solvents in the process taught by Miki in view of Roeder would have been obvious at the time the invention was made to a person having ordinary skill in the art. By doing so, one would have a reasonable expectation of success, as both reference are concerned with depositing ferroelectric layers by liquid delivery MOCVD.

Claim 52 is rejected under 35 U.S.C. 103(a) as being unpatentable over Miki et al. (US 6,309,894 B1) in view of Roeder et al. (TI, Defense Systems & Electronics Group), as applied to claim 38 above, and further in view of Visokay et al. (US 6,211,034 B1).

Miki, in view of Roeder, teaches the limitations of claim 38, but fails to explicitly teach the barrier layer. However, Visokay teaches a barrier layer made of TiAlN for limiting diffusion of the ferroelectric material in the substrate (column 2, lines 5-15). The reference also teaches that iridium is useful as an adhesion layer (column 7, lines 5-18). To use the barrier layer and adhesion layer taught by Visokay in the process of Miki in view of Roeder would have been obvious at the time the invention was made to a person having ordinary skill in the art. By doing so, one would prevent diffusion and increase adhesion of the PZT layer.

Claim 56 is rejected under 35 U.S.C. 103(a) as being unpatentable over Miki et al. (US 6,309,894 B1) in view of Roeder et al. (TI, Defense Systems & Electronics



Art Unit: 1762

Group), as applied to claim 38 above, and further in view of Kim et al. (US 6,229,166 B1).

Miki, in view of Roeder, teaches the limitations of claim 38, but fails to explicitly teach the nucleation layer. However, Kim teaches that a nucleation layer reduces that non-desirable imprint phenomenon (column 1, lines 60-68; column 2, lines 19-49). To use the nucleation layer taught by Kim in the process of Miki in view of Roeder would have been obvious at the time the invention was made to a person having ordinary skill in the art. By doing so, one would prevent the imprint phenomenon.

### ***Conclusion***

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Fazan et al. (US 6,165,804) is cited as being pertinent to the applicant's disclosure.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Eric B Fuller whose telephone number is (703) 308-6544. The examiner can normally be reached on Mondays through Thursdays.

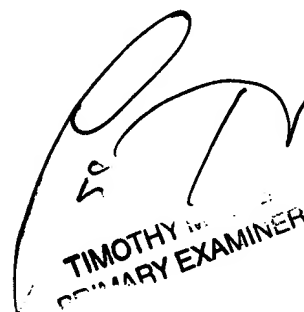
If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Shrive Beck, can be reached at (703) 308-2333. The fax phone number for the organization where this application or proceeding is assigned is 703 872-9310.

Art Unit: 1762

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0661.



EBF



TIMOTHY W. [unclear]  
PRIMARY EXAMINER